

In the *Zeitschrift für Elektrochemie* (vol. xii., p. 513) Prof. W. Kistiakowsky points out the existence of a relationship between the surface-tension values of different liquids which is analogous to the well-known Trouton's rule. If k denote the capillary constant of a liquid at its boiling point, m the molecular weight, and T the boiling point on the absolute scale, then mk/T is constant and equal to 0.0116 for about forty non-associated liquids which have been examined. In the case of associated liquids, such as the alcohols and fatty acids, the value of mk/T is much smaller, and on account of the considerable change in the value of the factor it appears to be eminently suited for ascertaining the existence of association in the liquid state of aggregation.

THE report of the principal chemist of the Government Laboratory for the year ending March 31 furnishes some interesting reading. The total number of samples examined at the laboratory at Clement's Inn Passage during the year was 106,779, the greater part being in connection with the revenue departments. In the Customs the increase in the number of samples examined, as compared with last year, was 2389, the Excise showing an increase of more than 18,000. Special attention was given to establishing a systematic check on the "obscuration" of enumerated spirits, that is, the change in the apparent strength of spirits, as determined by the hydrometer, caused by the presence of solid matters in solution. It is noteworthy that, in the case of tea, the evidence of deliberate adulteration was extremely rare. A small proportion of the tea entering the country was declared to be unsound and unfit for human consumption. Such condemned tea does not pay duty, and, after being denatured by the addition of lime and asafœtida, is allowed to be used in the manufacture of caffeine. Little improvement is shown in the freedom from adulteration of the beer supplied by publicans; 11.1 per cent. of the samples taken were found to be diluted. There is good reason, moreover, to believe that a notable amount of butter adulteration takes place in this country. A considerable increase is shown in the quantity of duty-free spirit used in colleges for purposes of research.

SINCE the atomic weight of silver is the basis upon which most of the atomic weights of other elements are founded, even a small change in the accepted value is not without importance. The *Comptes rendus* for September 10 contains a note on this subject by P. A. Guye and G. Ter-Gazarian. Owing to the great improvements in recent years in the methods of dealing with gases, physicochemical methods of determining atomic weights, originally only used as a rough guide for the purely chemical methods, have reached an accuracy at least equalling the latter. If the atomic weights of carbon, hydrogen, nitrogen, and chlorine related directly to oxygen by physicochemical methods be taken as a basis, the value 107.89 is obtained for silver instead of 107.93, obtained by Stas by the use of chlorates, bromates, and iodates. The authors give a summary of the work done by various workers on the latter compounds, and note a possible cause of error in the presence of potassium chloride in the potassium chlorate used. They show that these two compounds, on account of the fact that the chloride forms a solid solution of nearly constant composition, are very difficult to separate. They find that potassium chlorate, purified as far as possible by re-crystallisation, contains 2.7 parts of chloride per 10,000. Applying this correction to Stas's figures, an atomic weight of 107.89 is obtained, nearly identical with

the figures of Marignac in the analysis of silver chlorate; of Dixon and Edgar, by the direct determination of the ratio H:Cl; and of Richards and Wells, the ratio Ag:AgCl. In this way the results of the chemical and physicochemical methods are brought into agreement, leading to the conclusion that the atomic weight of silver should be lowered from 107.93 to 107.89.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN OCTOBER:—

- Oct. 2. Pallas (mag. 8.0) in opposition to the Sun.
- 3. 9h. 19m. Minimum of Algol (β Persei).
- 4. 15h. 35m. to 16h. 52m. Moon occults μ Ceti (mag. 4.4).
- 6. 12h. 30m. to 15h. 28m. Transit of Jupiter's Sat. III. (Ganymede).
- 9. 16h. 0m. Jupiter in conjunction with Moon (Jupiter $2^\circ 12' N$).
- 15. Venus. Illuminated portion of disc = 0.333; of Mars = 0.976.
- 18–22. Epoch of October meteoric shower (Radiant $92^\circ + 15^\circ$).
- 23. 11h. 1m. Minimum of Algol (β Persei).
- 25. 6h. 49m. to 6h. 56m. Moon occults ι Capricorni (mag. 4.3).
- „ 19h. 0m. Venus at greatest brilliancy.
- 26. 7h. 50m. Minimum of Algol (β Persei).
- „ Saturn. Major axis of outer ring = $42''.62$; minor axis = $4''.73$.
- 29. 13h. 0m. Jupiter stationary.

THE TOTAL SOLAR ECLIPSE OF JANUARY, 1907.—In a letter to the *Observatory* (No. 374), Mr. W. T. Lynn discusses the accessibility and suitability of Andishan as a place wherefrom to observe the total eclipse of the sun which will take place in January next year. This town is situated to the north-east of Samarkand, in the Khanate of Khokand, its approximate position being long. = $72^\circ 17' E.$, lat. = $40^\circ 50' N$. It is on the Russian Central Asiatic Railway, about 170 miles south-east of Tashkent. As a new line of railway runs to the latter place from Orenburg, the journey from Europe should prove a comparatively straightforward one. Andishan lies in the fertile valley of Ferghana, at the junction of the river Kara Darya (a tributary of the Syr Darya) and a smaller stream, so that there should be little difficulty in finding a suitable observing site for the eclipse parties. The eclipse will take place on January 14, 1907 (civil time), and the shadow track will be very narrow, thus limiting the choice of stations; the duration of totality will be about two minutes. By an obvious slip, the date is given as January 4 and the duration of totality as two seconds in Mr. Lynn's letter, as published in the *Observatory*.

OBSERVATIONS OF PHOEBE IN MAY AND JUNE, 1906.—Circular 118 of the Harvard College Observatory gives the positions of Phœbe, the ninth satellite of Saturn, as determined from six photographs obtained between May 18 and June 28, with the 24-inch Bruce telescope, at Arequipa. The places thus obtained are compared with those given by the ephemeris published in the *Nautical Almanac* for 1906, the differences (O–C) in R.A. and declination being given.

THE COLOURS OF SUN-SPOTS.—In the September number of the *Bulletin de la Société astronomique de France* M. Th. Hansen, of Praestö, Denmark, states that from many years' observations of sun-spots he is convinced that sun-spots exhibit colours proper to themselves, and not merely the results of instrumental chromatism. He observes that the spot nuclei are rarely, if ever, a dead black, but generally are of a decided violet colour. The preceding part of the spot is most often of a yellow colour, whilst red is generally predominant in the "following" parts, although green is also seen there. On August 11, 1903, a small but dazzling white facula appeared in the centre of a black spot whilst M. Hansen was drawing the same. Two plates showing the colours observed in the large spot of November, 1903, accompany the communi-

cation, and M. Hansen suggests that the colours of spots may eventually be differentiated by spectroscopic observations.

COLOURS AND MAGNITUDES OF DOUBLE STARS.—It is a generally accepted statement that when the magnitudes of the components of a binary-star system differ considerably their colours are also very different; similarly a slight difference in magnitude is usually accompanied by a similarity of colour.

Whilst preparing his recently published and valuable memoir on the double stars of Struve's "Mensuræ Micrometricæ" Mr. Lewis has gathered striking evidence that these statements are true, and in No. 373 of the *Observatory* he gives a table of physical pairs, from which it is seen that a gradual increase in the differences of magnitude is accompanied by constantly increasing differences of colour. A discussion of fifty double stars situated in the southern hemisphere corroborates this evidence.

ROTATION PERIOD OF JUPITER'S EQUATORIAL REGION.—In No. 4117 of the *Astronomische Nachrichten* Mr. Denning publishes the rotation periods, derived from a number of spots situated on the equatorial side of the southern equatorial belt of Jupiter, as determined by him at Bristol in the years 1898 to 1905-6 inclusive. From the tabulated statement given it is seen that the rate during 1905-6 was several seconds slower than in previous years. During 1880-3 the rotation period was from eighteen to twenty-seven seconds shorter than during 1905-6.

GEOLOGY AT THE BRITISH ASSOCIATION.

IT is only natural that the salient geological features of the district in which the association meets should in some degree influence the character of the papers presented to Section C. Yorkshire, being rich in glacial and post-glacial problems, it is not surprising that special attention was directed to the more recent episodes in the earth's history. The presidential address dealt with British drifts and the inter-glacial problem, and, after a review of all the evidence bearing on the question, Mr. Lamplugh pronounces that no proof of mild inter-Glacial epochs, or even of one such epoch, has been discovered during the examination of glaciated districts in England, Ireland, and the Isle of Man. The "Middle Glacial" sands and gravels of our islands afford no proof of mild inter-glacial conditions or of submergence. In most cases, if not in all, they represent the fluvio-glacial material derived from ice sheets. Most of the fossiliferous beds regarded as inter-glacial contain a fauna and flora compatible with cold conditions of climate, and, in the exceptional cases where a warmer climate is indicated, the relation of the deposits to the Boulder-clays is open to question.

Prof. Kendall followed the president's address with a full and comprehensive account of the general geological structure of the country round York, and dwelt specially on the glaciation of the Vale of York and the Cleveland Hills. During the meeting the members were enabled to visit the York moraine and study the glacier lakes and overflows in the eastern part of the county under the guidance of Prof. Kendall.

Other local glacial papers dealt with the Kirmington Drift deposits, recent exposures of glacial drift at Doncaster and Tickhill, post-glacial deposits at Hornsea, and the plain of marine denudation beneath the drift of Holderness.

Contributions dealing with drift problems farther afield were presented by Mr. F. W. Harmer, who continued his work on the glacial deposits of the east of England, and in another paper he applied the brilliant results obtained by Prof. Kendall in the Cleveland district to support his theory regarding "Lake Oxford" and the origin of the Goring Gap.

The Rev. W. Lower Carter applied the same results to explain a dry valley which had been a glacier-lake overflow at Cwm-Coed-y-cerig, in South Wales, and gave a detailed account of the local glaciers which formerly existed in the valleys of the Usk and Wye.

Mr. R. D. Oldham brought forward a criterion of glacial erosion of lake basins, and Prof. J. W. Gregory

initiated a discussion on the problems connected with the Palæozoic glaciation of Australia, India, and South Africa. He pointed out that in Australia we have evidence of three horizons at which glacial beds occur, the Cambrian, the Carboniferous, and the Pleistocene. The Cambrian glacial beds near Adelaide range 400 miles north and south, and are interbedded with marine sediments containing a rich Cambrian fauna. Evidence of Pleistocene glaciers has only been found on the mainland near the summit of Mt. Kosciusko, the highest mountain of Australia. The Carboniferous glaciation is the most important, and presents points of the greatest interest. While in the State of Victoria there exists undoubted evidence of land ice riding over an irregular land surface, in New South Wales, West Australia, and in India the glacial beds include some that were laid down below sea-level. Beds presumably of this age are also found in South Africa, South America, and perhaps on the eastern flanks of the Urals. Prof. Gregory pointed out the inherent probability of these beds having formed part of a once continuous sheet of glacial deposits. No proof is forthcoming that they were synchronous, and in Africa and Australia the glacial evidence disappears to the north, ending about the southern tropic, and begins again in the northern hemisphere in latitude $17^{\circ} 20' N.$, increasing in strength northwards to Cashmere.

After a critical survey of the three theories which have been advanced to explain this problem, viz. (1) the shifting of the earth's axis (Oldham and Penck); (2) a universal refrigeration of the world due to a change in the composition of the earth's atmosphere (Arrhenius); and (3) local concentration of snowfall in consequence of a different distribution of land and water, Prof. Gregory concludes that the last is alone adequate to explain the facts.

In the discussion which followed, Prof. Edgeworth David and Mr. T. H. Holland argued in favour of Arrhenius's theory, as the cause must have been worldwide, and the phenomena could not be accounted for by local changes in topography. Mr. R. D. Oldham favoured Prof. Chamberlain's adaptation of Arrhenius's carbonic acid theory, and pointed out the analogies between the great revolutionary epochs of the earth's history, all of which are associated with glacial phenomena.

The stratigraphical papers certainly showed a bias towards the Carboniferous period. No less than five papers were read, dealing mainly with the faunal succession and zoning of beds of this age. The recent work of Dr. Wheelton Hind, Dr. Vaughan, Prof. Garwood and others, as detailed in their papers, shows great strides towards the completion of what, at one time, seemed a hopeless problem.

A discussion on the origin of the Trias was opened by Prof. Bonney and Mr. J. Lomas. Prof. Bonney considers the Bunter to be chiefly of fluvial origin, the rivers carrying the materials having their origins in Scotland, the extreme north of Ireland, and another flowing from the south-west. The Keuper he regards as indicating the setting in of inland-sea conditions, and the Red Marl as having been deposited in a great salt lake. The physical and climatal conditions of the Trias were probably to some extent comparable with those now existing in certain of the more central parts of Asia, such as Persia or Turkestan.

Mr. Lomas compared the Triassic deposits with those now forming in desert regions. He pointed out that the dominant feature of deserts is concentration. The wind acting on loose material concentrates particles of equal size in one place, an arid climate tends to concentrate the salts brought down by rivers in solution in shallow pools held up by the irregular disposition of sand dunes, and animal and plant life is concentrated in those regions where water is more or less permanent. Taking the various divisions of the Trias, he showed that in the Bunter the pebble beds of the Midlands may be compared with those of Lancashire and Cheshire, the only difference being that the former may have been subject to the sifting action of wind, which has removed the smaller sand particles, while the latter has, in part, escaped this action, and has been augmented by material from the south. The Upper Bunter he cited as a striking example of concentration of particles of even size. The Keuper shows evidence of similar sift-